Vol. 1 No. 8 HQ, MALARIA CONTROL, APO 503 25 July 1944

Survey of Japanese Prisoners For Malaria and Intestinal Parasites

by

Lt. R. B. Burrows and Capt. C. O. Mohr

1. A survey was made of the Japanese prisoners on Sagiang Kapuing Island and at the First Field Hospital, with the object of determining what parasites these prisoners harbored and the incidences of infection. It was believed that such data would be of value to our troops, who are taking increasing numbers of Japanese bivouac and other areas, so that they could be warned of the precautions to take in avoiding these infections.

2. Altogether 340 prisoners were examined. Of this number 123 were examined for malaria and intestinal parasites, 146 for malaria alone, and 71 for intestinal parasites alone. Due to the fact that the prisoners were constantly being transferred back and forth between the island and the hospital, new prisoners were arriving every few days, and many stool specimens sent in were worthless, it was impossible to make a complete survey in the time available. Daily expectation of receiving movement orders precluded the obtaining of numerous additional specimens of the two latter groups, totaling 225 prisoners. However, the number of smears and stools obtained gave excellent knowledge of the infections carried by the Japanese.

3. For the study of malaria two smears were made of each prisoner. Each prisoner's smears were examined by two different persons, so that even the lightest infections would be caught.

4. All prisoners, both on the island and in the hospital, were receiving Atabrine at the time smears were made. Some had been prisoners for weeks, whereas others were newly captured. Although the Japanese made their soldiers follow a routine suppressive treatment, many of these prisoners had wandered around in the jungles for weeks before being captured and during that time were not able to continue the routine use of drugs.

5. Sputum cups were supplied to an English-speaking prisoner on the island and to the ward attendant at the hospital. These wrote the prisoner's names on the cups and kept them straight. However, about ten percent of the specimens sent in had to be discarded for one of the following reasons: a mere wiping which dried on the toilet paper; a neat package of wrapping paper, cloth, or toilet paper which left the material dry; and a few drops which dried in the cups. It was difficult to get many of the prisoners to put the fecal material directly in the cup, as they preferred making fancy packages, even tied with string at times, and placing these in the cups.

6. Fecal samples sent in to the laboratory were examined fresh, in normal saline, and by zinc sulfate flotation. The latter was not used exclusively, as done in so many laboratories, for trophozoites of protozoa, helminth larvae and operculated ova are rarely seen in such preparations. On those days during which more specimens were obtained then could be examined, the extra ones were emulsified in small vials of 10% formalin and examined later.

7. The results of the malaria survey are as follows:

	Number	Percentage
Number prisoners examined	268	
With P. vivax	10	3.7
With P.falciparum	54	20.2
With P. vivax and P. falciparum	1	0.4
Total positives	65	24.3%

As the gametocytes of P. falciparum are often present, even with Atabrine treatment, it was natural to expect the majority of positives to be of this type. In this survey the ratio was one vivax to five falciparum. One-fourth of the prisoners were positive for one or more species.

8. The incidences found for the various intestinal parasites are as follows:

	Number	Percentage
Number prisoners examined	194	
With: Endamoeba histolytica	5	2.6
Endamoeba coli	16	8.2
Endolimax nana	1	.5
Ascaris	28	14.4
Hookworm	64	33.0
Trichuris	30	15.5
Strongyloides	3	1.5
Trichostrongylus	3	1.5
Schistosoma japonicum	3	1.5
Clonorchis	1	.5

It can be seen from this table that the majority of intestinal infections of the Japanese are pathogenic. Protozoan infections, including the pathogenic E. histolytica, are rather uncommon, as only 11.3% showed these.

9. As many of the prisoners had multiple infections, a breakdown is given in the following table:

		Number		Percentage
Negative		79		40.7
Single infections:		83		42.8
Hookworm	37		19.2	
Ascaris	16		8.2	
E. coli	11		5.7	
Trichuris	8		4.1	
E. histolytica	4		2.1	
Schistosoma	3		1.5	
Trichostrongylus	2		1.0	
Strougyloides	1		.5	
Clonorchis	1		.5	
Double infections		27		13.9
Hookworm, Trichuris	14		7.2	
Ascaris, Hookworm	7		3.6	
Ascaris, Trichuris	2		1.0	
Hookworm, E. coli	1		.5	
Hookworm, Trichostrongylus	1		.5	
Trichuris, E. coli	1		.5	
E. coli, E. nana	1		.5	
Triple infections:		3		1.5
Ascaris, Trichuris, Strongyloides	1		.5	
Hookworm, Trichuris, E.histolytica	1		.5	
Hookworm, Trichuris, E. coli	1		.5	
Quadruple infections:		2		1.0
Ascaris, Hookworm, Trichuris Strongyloides	1		.5	
Ascaris, Hookworm, Trichuris, E.coli	1		.5	

From this table it can be seen that in the majority of multiple infections worms predominate. And the number of infections are approximately equally divided between those acquired orally and those which penetrate the skin.

10. While in New Guinea this unit has made malaria examinations on these other groups: American soldiers, Missionaries (American and German) and Javanese. The latter two groups are refugees who have been interned by or under control of the Japanese for sixteen months. The Javanese were probably heavily infected from childhood. The following table gives a comparative view of the findings:

	Soldiers	Missionaries	Javanese	Japan.
Blood smears made	370	14	19	268
Pos. for P. vivax	1.4%			3.7%
Pos. for P. falciparum	0.3%	7.1%	5.3%	20.2%
Pos. for P.vivax and falciparum	0.3%			0.4%
Total positives	1.9%	7.1%	5.3%	24.3%

Where Atabrine or other suppressive drugs are not used regularly, the incidence of malaria is higher. The refugees and the prisoners were given Atabrine regularly, but some had had it for only a short time before the smears were made.

11. To supplement these surveys an interview was had with Dr. Theodore Braun (American), of the German Mission Hospital at Hollandia. Although he was interned by the Japanese for sixteen months, he was consulted by them regarding various diseases and he had opportunity to observe the sanitary measures carried out by the Japanese. Some of his observations furnish an explanation for the high incidences of infection among the Japanese. These are the main points:

a. Japanese soldiers regularly receive suppressive treatment for malaria and are required to use a mosquito bar, to wear nets and gloves at night, and, to use repellent. However, many soldiers were indifferent to, or lax, about these precautions. The repellent is not as effective as that given our soldiers.

b. Amebic infections and P. malariae are not common in New Guinea, so the opportunities for the Japanese to pick up these infections is rather small. Probably most of the amebic infections were brought to New Guinea with them.

c. The Japanese probably acquired few worm infections from the natives here, as they have better latrine facilities than most Japanese camps. The natives set aside a certain area, usually a small plot of ground for the entire village. Pigs generally hover around these areas and clean up the stool as soon as the person leaves. However, the opportunities for picking up new infections does exist, for it is not known to what extent pigs pass on human infections.

d. Latrine facilities around Japanese camps are quite conducive to the spread of infections. When wooden latrines are built, which does not happen in all camps, they are not made fly-tight and often lack lids. Soon the latrine is crawling with maggots and the soldiers use the ground around the latrine or the bushes on the edge of the camp area. Thus it is quite easy for flies to carry cysts and ova from the latrines or bushes to the messline, and the larvae of hookworm and other skin penetrating parasites have ample opportunity to develop in the soil and to infect other individuals.

e. In reply to the question asked concerning the scarcity of flatworm infections among the prisoners, Dr. Braun said that the Japanese appeared to be more concerned with Schistosome infections than with roundworm infections. He suggested that the soldiers may have been checked for possible fluke infections before leaving Japan.

12. Inasmuch as chlorination does not kill the cysts and ova, soldiers should be warned of the risks they run when they take water from the neighborhood of abandoned Japanese camps. They should be made to realize that Halazone tablets do not destroy these parasites. Water should be taken only from our camp areas or from springs far removed from old camp sites. When in doubt, a soldier should, if possible, heat the water to a steaming temperature and then cool it before adding the chlorine.

13. Soldiers should be informed of the methods by which hookworm and other related forms enter the body, so that they would be on the alert for "ground itch." Digging foxholes, resting the hands on the ground, or walking barefooted in abandoned areas should be avoided as much as possible, although it is realized that such precautions are not always possible.

14. Our soldiers should be informed that the Japanese are heavily parasitized, have very unsanitary latrine facilities, and their camp areas are a potential source of infection to all troops taking over such areas.

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PUBLICATION OF ARTICLES

To all Malaria Survey and Control Unit Commanders:

Now is the time to get your name in print. Any articles on non-specific control methods, life cycles, surveys of areas, personnel, etc. Do not mention units or army moves, use the designation U.S. Army troops, a combat unit, Air Force, natives, POW, etc. and places should be the geographical part of New Guinea or islands.

Tech. Memo No. 4, Headquarters USASOS, 10 February 1944 is quoted for the information of all concerned.

1. The publication of articles on medical subjects by officers and enlisted men of the Medical Department in this theater is encouraged.

2. Such articles will be submitted through medical channels to the Surgeon General's Office, in triplicate. One copy will be retained in the Office of the Chief Surgeon, USASOS, and the remaining two will be indorsed to The Surgeon General.

3. The provisions of S.G.O. Circular Letter No. 192, 20 November 1943, will be followed in the composition and format of the articles submitted. A copy of Circular Letter No. 192 is inclosed.

4. The War Department has directed that no information concerning malaria control measures in overseas theaters shall be given out. This limitation of subject matter will be observed.

WITHIN THESE LIMITATIONS -- GO TO IT

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New Publications. From the Navy's South Pacific Newsletter of June 1944, we quote this information which might prove to be of interest of all.

Two recent publications concerning mosquitoes are now available at their source: (1) An Atlas of the Mosquito Larvae of the Australasian Region. Tribes - Megarhinini and Culicini, 1944 by D. J. Lee. Obtained by writing Medical Directorate, Army Headquarters, Melbourne, Victoria, Australia. (2) Epidemiology of Diseases of Military Importance in the Netherlands Indies. Including the identification and distribution of arthropods of medical importance. By D. S. Farner, Ensign H-V(S) USNR, Bureau of Medicine and Surgery, Division of Preventive Medicine, Potomac Annex, Washington 25, D. C.

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PRELIMINARY NOTE ON

THE USE OF D.D.T. AS SPRAY (LIQUID AND DUST) IN DWELLINGS

by
Colonel Paul F. Russell, M. C.
Chief Malaria Control Branch, ACC

I. Application of 5% D.D.T. in kerosene.

Preparation of material.

In accordance with War Department Technical Bulletin Medical No 14, D.D.T. was mixed with kerosene at the rate of 7 ounces of D.D.T. per gallon of oil. In general, kerosene is delivered in 55 gallon drums containing approximately 53 gallons of kerosene. On this basis, 23 pounds of commercially pure D.D.T. were added to each drum of kerosene. Stirring of the mixture is advisable, and this was obtained by turning the drums several times each day. Solution of the D.D.T. in kerosene is not rapid, and if possible, an interval of 4 days should be allowed before the material is used. Allowing barrels to stand in the heat of the sun facilitates solution. A concentration of 5% represents almost a saturated solution in kerosene.

Since there is some indication that D.D.T. in oil solution may be poisonous to man if allowed to remain in contact with the skin for more than a short time, barrels containing a D.D.T. - kerosene mixture should be clearly marked and kept separate from any other kerosene or oil supplies. Laborers should be cautioned to wash thoroughly with soap and water after working with D.D.T. Any clothing soaked or spotted with the oil solution of D.D.T. should be changed and laundered

Application.

The finished solution should be applied as a thin coating; after application, the treated surface should appear only slightly moist. If the surface is wet or if there are any run-off trickles, the material has been wasted. One quart of material should be sufficient to treat 1000 sq. ft. of surface.

The spray gun being used should be so adjusted to produce a stream of medium to coarse droplets. The spray should not be a mist spray. Too fine a mist allows much of the spray to fall to the floor or escape into the open air. Constant breathing of a spray mist may also be hazardous to the operator.

A paint brush is recommended for treating such mesh surfaces as window screens and may be preferable in treating such articles as light drops, light fixtures, etc.

Spray Equipment.

Comparative tests of efficiency of the various types of spray equipment used offered the following conclusions:

The efficiency of the gasoline engine power sprayer is outstanding. The unit can be mounted in small trailer or in a weapons carrier, thus making it easily portable. Two spray guns may be run off of the same engine compressor. (Units supplied with two material containers and two spray guns.) In operation of the engine compressor it has been found that 10 to 15 pounds per square inch pressure of the air line and 15 to 20 pounds per square inch pressure on the material line are adequate. Intelligent supervision of the gasoline engine is obligatory. As the equipment was designed for paint spraying and not spraying of low viscosity liquids such as kerosene, the motor speed must be throttled down considerably and the pressure in the air and material lines adjusted as recommended. In actual spraying the nozzle (extension tube always used) is held about 12 inches from the wall surface and carried along horizontally and parallel to the wall surface rather than in a brush stroke arc.

For all practical purposes the De Vilbiss type of hand compressor paint sprayer and the Indian back pack fire extinguisher can be eliminated from consideration for use in house spraying. The Hudson or Dobbins 5-gallon knapsack sprayer gives fairly good surface coverage but mechanical defects in the equipment (allowing leaks) and the elaborate measures necessary for protection of the operator mitigate against its use by general military personnel. The sprayer liquid insect continous 2½ gallon (or Decontamination apparatus 3-gallon) affords good coverage, good economy of time and materials and safety to the operator.

The "Flit Gun" sprayer has the great advantage of availability. However, coverage is only fair, the spray is usually too fine, and the tendency of the gun to spit and leak are definite handicaps. Many of the guns are of but one pint capacity and it is arduous work to maintain enough pressure for a adequately forceful projection of spray. For "over head" surfaces the gun must be held very close to the surface, otherwise the spray escapes into open air or falls back on the operator and floor.

II. Application of 10% D.D.T. Powder (Talc base).

Preparation of Material

The powder used was the mixture of 10% D.DT. in pyrophyllite prepared by the McCormick Company, Baltimore, and the same as that used in typhus control.

Powder may be prepared by mechanically mixing D.D.T. and a suitable diluent. The only local diluent that can be recommended generally is talc of the same quality commonly used in face and body powders. Considerable difficulty may be experienced in locating supplies of talc.

Application: Even distribution of powder on wall and ceiling is difficult to obtain. One must attempt to project a fairly heavy cloud of powder onto the surface to be covered. The amount of powder clinging to a surface is, to some extent, dependent on the type of surface (rough surfaces retain more than smooth). Wetting the surface to be powdered with water has been tried and seems advantageous (sticking agents other than water are to be tried). Further observations on kill and length of residual toxicity are necessary. Water was applied by means of 2½ gallon continuous liquid sprayer. Dust respirators and eye shields should be worn by the operator.

EQUIPMENT.

The only available item of equipment for powder application is the "Duster, insect powder, plunger type" (Hudson Admiral) (a stocked Q.M. item). The hand rotary type duster is too cumbersome for inside dusting.

A specially designed pressure hand duster that can be used with Binks or DeVelbiss type engine air compressor paint sprayer has been tried. This method of dust application is very promising.

To powder a dwelling of 7650 sq. ft. of wall and ceiling surface, 4 pounds of 10% D.D.T. powder was required by the hand pump duster, and 3¼ pounds of powder by the air pressure duster. The constant pressure (25-30 lbs. per sq. in.) afforded by the engine compressor permitted more even surface coverage and better carrying powder than the hand-pumped duster. A serious defect in the hand pump is the considerable variation in individual stroke delivery of powder when the powder container is entirely filled and when nearly empty. Also the powder delivered is largely dependent upon the rapidity and force applied to the hand plunger by the operator.

In using either type of equipment it was found that holding the nozzle of the gun at a 20-25° angle to the wall surface rather than at right angles, afforded better surface coverage, with less wastage of material.

On the basis of actual consumption of 100% D.D.T. it would appear that powdering affords at least a 50% saving in material. D.D.T. being water insoluble, is harmless to the worker (proven during typhus control dustings, where 10% D.D.T. powder was used in over 3 million dustings). Experiments are being carried out in dwellings on comparison of the residual killing effect of kerosene - 5% D.D.T. and 10% D.D.T. in powder. If dustings with powder should prove as effective as liquid spraying, suitable equipment should be designed to afford better means of application.

Summary.

1. The unique quality of D.D.T. in adult mosquito and fly control is its stability as a killing agent on a surface where the insect lights. The main objective is not to destroy immediately the insects flying about at the time of treatment. The primary purpose is to deposit D.D.T. on the surface of walls, Ceilings, and other resting places. If this is well done, than any fly or mosquito which alights on the sprayed surface will come in contact with the D.D.T. This chemical will be absorbed through the cuticle of the insect's feet or proboscis and will kill it slowly, it is suggested, by poisoning its nervous system. It is known from experimental evidence that this killing effect of D.D.T. will persist for several weeks after one application. In view of these facts, D.D.T. sprays should only be directed upon surfaces.

2. Obviously, in view of the above, it is important to put the D.D.T. so far as possible on surfaces where flies or mosquitoes are known to rest. It is known that the malaria-carrying mosquito rests in the daytime inside houses, stables, out-buildings, and culverts, especially in the darker, quieter places, or under furniture. Flies, on the other hand, are not averse to sunlight. They rest around garbage racks, and loading platforms, latrines, mess and kitchen screens, ceiling beams, electric light cords, etc. Therefore , attempt should be made to put the D.D.T. spray on all surfaces where either flies or mosquitoes will rest. Usually, this means a general spraying of all wall and ceiling surfaces together with such outdoor fly resting places as are known to exist.

3. D.D.T. is in very short supply and must not be wasted. It is not a substitute or a magic wand. Every measure heretofore employed against mosquitoes and flies should be continued energetically. The added effect of the D.D.T. may insure much more complete success in controlling mosquito and fly-borne disease.

4. D.D.T. is toxic to man and animals when absorbed. The powder is not soluble in water and is not toxic through external application to the skin. It may be toxic when ingested and must be kept out of food and so marked that it will not be mistaken for a foodstuff.

D.D.T. in kerosene or other oils is definitely toxic to the skin. It will produce a dematitis. Moreover, it will be absorbed in oil through the skin and may cause necrotic changes in the liver. Consequently, it is important that great care be used in applying D.D.T. sprays. Those who use the sprays should be so protected that the spray will not come in contact with the eyes or the skin and will not be inhaled into the lungs.

Live stock can eat D.D.T. on fodder up to about 150 mg/kg of body weight without harm. But it is known that 800 mg/kg of the body weight will cause visceral damage.

5. The National Research Council recommended a dose of 1 quart of 5 per cent D.D.T. in kerosene per 250 square feet of surface treated. Our preliminary studies indicate that one quart is sufficient for 1000 square feet.

6. For fly destruction the treatment of mess and kitchen screens on windows and doors is useful. It is much more economical of D.D.T. to use a paint brush rather than a sprayer when coating screens. The D.D.T. in kerosene should be brushed on the screen in the same manner that paint would be applied, care being taken to protect the one who applies it.

7. For small projects the usual "Flit gun" type of sprayer is the best available. It should be held not more than one foot from the surface to be sprayed. For larger projects the best type of spraying equipment is the Binks motor driven compressor with spray gun.

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ENTOMOLOGICAL

Captain Owen H. Graham, Sn.C., CO of 5th Malaria Survey unit sends in the following bit of news which we are sure will prove of interest to all.

Representatives of 23 species of mosquitoes which this unit had collected in the Southwest Pacific were sent to the Army Medical School in Washington, D.C. in April. These specimens were turned over to Dr. Alan Stone, entomological taxonomist in the United States National Museum, for identification. In a recent letter Dr. Stone sent us a list of the corrections and changes he had made in our tentative determinations. Our identifications and those of Dr. Stone's are listed below.

CLASSIFICATION

5th Malaria Survey Unit	Dr. Stone
Bironella sp. (from Milne Bay)	B. gracilis
Anopheles bancrofti	A. bancrofti
Anopheles punctulatus var typicus	A. punctulatus punctulatus
Anopheles punctulatus var moluccensis	A. punctulatus farauti probably
Uranotaenia albescens	U. argyrotarsis probably
Uranotaenia nigerrima	U. nigerrima
Rachionotomyia atra	Tripteroides filipes
Rachionotomyia atripes	Tripteroides filipes
Rachionotomyia sp.	Tripteroides magnesiana (new to National Museum collection)
Megarhinus speciosus	M. speciosus
Mansonia uniformis	M. uniformis
Armigeres breinli	A. breinli
Aedes albitarsis	A. albolineatus
Aedes albopictus	A. albolineatus
Aedes funereus var ornatus	A. funereus var ornatus
Aedes kochi	A. kochi
Aedes notoscriptus	A. notoscriptus
Aedes papuensis	A. papuensis
Aedes variegatus	A. scutellaris hebrideus
Lutzia halifaxi	Culex halifaxi
Culex annulirostris	Culex annulirostris
Culex papuensis	C. fraudatrix
Culex pullus	C. pullus

Captain Graham says, "This information is, to say the least, interesting." The Editor agrees.

Survey of Native Laborers
at the ANGAU Native Labor Camp, Nadzab, for Intestinal Helminths.
by
Capt. K. V. Krombein, Sn.C., CO, 32nd Malaria Survey Unit

1. During the period 7 May to 17 June 1944 fecal samples on 167 male native laborers at the ANGAU Native Labor Camp were examined for helminth ova and larvae.

2. A simple flotation with saturated zinc sulfate emulsions were allowed to stand at least one hour before examination.

3. Results (167 individuals):

Helminth	No. of individuals Pos.	% Positive
Necator americanus	152	91
Trichuris trichuira	30	18
Ascaris lumbricoides	8	5
Strongyloides stercoralis	1	0.7

29 individulas (17%) showed more than one species of helminth.

4. Discussion:

a. Inasmuch as these natives are in or around our installations for a large part of the day, it should be pointed out that almost 100% of them are heavily infested with intestinal helminths.

b. Since natives are not too particular where they defecate, hookworm (N. americanus) and strongyloid larvae are undoubtedly present in large numbers in the soil. The contact of skin surfaces with the ground (sun-bathing, sleeping, walking barefoot) entails possible exposure to hookworm infection and should be carefully guarded against.

c. Chances of hookworm and strongyloid infection would be greatly reduced if natives were treated en masse with tetrachlorethylene. This would not only lessen the danger of infection of our troops, but would ultimately raise the standard of work done by these natives.

d. Since roundworm (Ascaris) and whipworm (Trichuris) infections are often acquired by eating unclean food, the thorough washing of vegetables and fruits obtained from natives cannot be overemphasized.

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During the month of June a study was made of the Malaria Case Report Cards to determine the percentage of regular and irregular suppressive treatment. The following are the results of this study.

	Total Cases	Regular Suppressive	Irregular Suppressive	Percent Irregular
USASOS	327	230	97	27%
6th Army	857	701	157	18%
14th A A	103	83	20	19%
5th Air Force	292	166	126	43%
13th Air Force	9	1	8	89%
USAFFE	29	15	14	48%
Total	1617	1196	422	35%

Of 90 Officers -- 36% admitted irregular suppressive treatment.
Of 2 Nurses -- both had regular suppressive treatment.

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CORRECTION

In the No. 6 issue of this paper dated 20 May 1944, there appeared a translation of Japanese Malaria Regulations. On page one, under Chapter II, Article 8, par. 1, appears the term "sulphur chloride". A more exacting translation was requested by Major Wainwright, who is doing medical intelligence work. It appears that the translator was slightly off, and that this should have read: "Quinine sulfate".

METHOD OF SECURING ROUTINE LARVAL DATA

The following is an extract from a report made by Captain S. E. Shields, CO of the 24th Malaria Survey Unit.

In news letters and reports of other units available here, there has been no mention of a standard method of securing routine larval data. Our method, while not new, might be of some value to other units, particularly new units just arriving in the area. It shows the following data:

(1) Base or installation

(2) Date of survey

(3) Collectors or collecting party

(4) Section map and grid coordinates: This is valuable in helping the control unit locate the breeding areas.

(5) Water area surveyed:

a. Total water area - This proves valuable by giving a basis for computing the control efficiency, helps to show, by a comparison of different periodic inspections, the effects of rainfall, grading and crater filling operations.

b. By estimating the amount available breeding area a definite value can be put on control work and its efficiency. A combination of the sub-headings under this data will readily inform the units working in the area of the true control picture in relation to water surface to be controlled and the breeding areas then available.

(6) Description of Breeding Place: The following breeding situations are recorded here. A standard terminology is used.

a - sunny	i - swamps
b - shaded	j - hoof prints, wheel ruts
c - fresh water	k - streams
d - polluted	l - artificial containers
e - clear	m - craters, slit trenches
f - muddy	m - tree holes
g - vegetation	o - coconuts, stump, leaves
h - ground or rock pools	p - other

(7) Anophelines: This is self explanatory. The species determination of course is made later in the laboratory.

(8) Culicines: Similar to (7). There is space for a later addition of identifications.

(9) Lot Number: This can be used to record the collections in the field and later for a permanent reference. All collections this unit has made for permanent specimens are coded with our serial lot number as well as the species label.

The advantage of this form, as we have modified it after several months, over other forms used are:

a. Daily collections of a party are readily available on one sheet - not a whole handful.

b. The data may be kept on these sheets as a permanent record or summarized by months.

c. Convenient size to attach to reports or to file.

d. All necessary data on one sheet.

It seems as though a standard form for routine collections should be adapted and this is offered for consideration.

SAMPLE FORM:

AUTH CO 24TH MALA SUR
INIT
DATE

24TH MALARIA SURVEY UNIT
LARVAL MOSQUITO COLLECTIONS

Place _____ Date _____ Collectors _____

SECTION AND GRID	WATER AREA TOT	WATER AREA AVLB BRDG AREA	DESCRIPTION OF BREEDING PLACE	ANOPHELES AV. DIP	ANOPHELES SIZE	ANOPHELES SPECIES	CULICINES LOT

(Eds Note: We would appreciate it if units would send in suggestions, criticisms, or ideas of their own in regards to a standard method of making and keeping records of larval mosquito collections.)

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Various Breeding Places of Mosquito Larvae Collected at Lake Sentani, Humboldt Bay Area, and Depapre Bay Area, Dutch New Guinea

The following information was forwarded to us by Major Thomas A. Hart, Lt. Basil G. Markos, and Sgt Aaron Bass, of the Sixth Malaria Survey Unit.

Culex fatigans - This species has been found breeding in tin cans containing polluted water, in polluted water in mangrove swamps, polluted stagnant streams, and bomb crater holes.

Culex Whitmorei - Taken in tin cans containing polluted water, wheel-ruts which were sunlight and contained clear water, in pot-holes, in grassy marshes and swamps, and also in stagnant streams.

Culex pullus - This species has been taken in polluted water in tin cans with Aedes aegypti, in a partly sunlight Sago palm swamp polluted with decaying vegetation; in a polluted mangrove swamp; in polluted pot-holes; in sunlight wheel-ruts; in pools of streams containing heavy vegetation and sunlight; in wells; in rubber tires holding water; in stagnant pools which were shady and contained heavy vegetation and natural trash such as leaves and sticks, etc; in bomb crater holes; in helments; in empty crank cases; in wheel-ruts; batteries; discarded mess kits; etc. This species, as is evident, had a wide range of possible breeding places.

Culex Halifaxi - This species has been taken in a Sago palm swamp; in sunlight pot-holes; in grassy marshes and swamps; in polluted, sunlight side waters of streams; in rubber tires holding water; and in wells.

Culex annulirostris - Taken in Sago palm swamps; in polluted water in Mangrove swamps; in pot-holes; in grassy marshes and swamps; in bomb crater holes; and also in bomb crater holes which were sunlight and polluted with rubbish.

Culex sitiens - Taken in pot-holes and in bomb crater holes, containing water polluted by decaying food (sunlight). First record of this species in Dutch New Guinea.

Culex fraudatrix - This species has been taken in sunlight crater holes, polluted with rubbish.

Culex malayi - Found breeding in wheel-ruts.

Culex pelidus - Taken in stagnant streams and brooks.

Culex squamosus - Found breeding in clear, sunlight, side-waters of a stream containing heavy vegetation.

Anopheles punctulatus punctulatus - This species has been found breeding in sunlight and shaded wheel-ruts, and pot-holes.

Aedes aegypti - This species has been taken in tin cans; found breeding in polluted water in tin cans exposed to sunlight.

Aedes longirostris - Found in highly polluted water of a Sago palm swamp. First record of this species in Dutch New Guinea.

Aedes vexans - Taken in highly polluted water of a Sago palm swamp; also taken in pot-holes.

Aedes scutellaris - Found breeding in tree-holes; in bamboo stumps; in helmets; in tarpaulins holding water; in tin cans; also taken in fallen bamboo shafts.

Aedes annandalei - Found breeding in fallen bamboo shafts holding water. First record in Dutch New Guinea.

Ficalbia mettalicus - Taken in grassy marshes and swamps. First record in Dutch New Guinea.

Uranotaenia nigerrima - Taken in sluggish, shady streams, whose current was impeded by numerous fronds of Sago palm. First record in Dutch New Guinea.

Uranotaenia atra - Found breeding in polluted water of a Sago palm swamp; in pot-holes polluted with dense decaying vegetation; in clear water of a shady, sluggish stream, the flow being slowed up considerable, by numerous Sago palm fronds; in stagnant, shady pools containing much natural trash.

Uranotaenia pygmaea - Found breeding in Sago palm swamps; in streams and brooks. First record in Dutch New Guinea.

Megarhinus sp. - Have been taken in tree-holes and also in cardboard containers holding water.

Armigeres sp. - Have been found breeding in coconut palm shell and husks.

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A few other items of mosquito breeding places have been noted from the reports of other units. These include the following extract from a report of the 30th Malaria Survey Unit commanded by Captain C. O. Mohr, Sn. C.

"Most unusual breeding place found was in metal dump truck bodies of an Engineer Heavy Shop Co. Some of the trucks were nearly full of water and heavily inhabited by mosquito larvae and papae. Occasional Anopheles larvae were found in wooden cartridges boxes, generally only one to four being present

And the following from the 6th Malaria Control Unit commanded by Captain James O. Bennett, Sn. C.

"As in the month of May the only Anopheline found breeding in the territory assigned the 6th Malaria Control Unit was Anopheles punctulatus typicus and A. punctulatus moluccensis. The breeding was found principally in the kuni grass swamps, the species being moluccensis. Both typicus and moluccensis were found in bomb craters. Moluccensis was found breeding in a tin container. This was the first time in this area that the writer had found Anopheline breeding in artificial containers."

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An unusaul breeding place of Anopheline larvae was found by the NCO in charge of the unit malaria detail of Inter Sect, when he found larvae in the loading scoop of a cemment mixer.

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A quotation from the report of the 64th Malaria Control Unit, 1st Lt. John W. Lapsley, Sn. C., Commanding: "'Malaria Day' was continued in all areas, all on a small scale, except for the 80th Field Artillery, where necessary details were used on Wednesdays of each week using from 25 to 30 men. In the other areas most of the drainage had been completed and only maintainance details were used. Many rats were found in the proximity of the occupied areas due to the concentration of trash made by clearing camp sites. These hazards were slowly being cleared up."

The finding of "many rats" was of interest and being it casues so much discomfort to many of us, we asked Captain Ralph E. Pawley, M.C., to write for us an article, which he did, titled:

The Junle Rat

The jungle rat is a nocturnal animal and prefers to travel through narrow passages or runways along a wall, a habit which is an important factor in the success of trapping and poisoning procedures. Rats tend to migrate in accordance with variations in the abundance and accessibility of their food supply and the availability of shelter. Their choice of shelter is under storerooms, empty building walks, and trees, where they are least likely to be disturbed.

The most effective measures for the continued control of rats within a given area are those which prevent the rat from reaching a food supply and which deny it shelter and concealment. Rat proofing of store rooms is excellent, yet difficult to accomplish in New Guinea. The storing of foods such as cookies and open cans of peanuts in soldiers tents attract rats and thus must be properly controlled. It is also important to dispose of edible wastes in such a manner that they are not accessible to rats.

The best procedures, for destroying rats in the tropics are poisoning and trapping. These usually fail unless they are skillfully and continuously prosecuted.

Poisoning will not destroy all the rats in a locality, as the survivors soon become suspicious and will not take the baits. This disadvantage may be overcome in part, and greater success attained, by placing a large number of baits at one time and frequent changes in the kind of bait.

Barium carbonate is an efficient rat poison and is obtainable from the Quartermaster. It is a heavy, odorless, tastless powder and is poisonous in small quantities for rats. A dose of about two grains will kill a rat, larger doses will kill cats, dogs and larger animals. It is relatively non-poisonous for man, except when consumed in large doses. Barium produces an intense thirst and tends to cause the poisoned rats to leave the building in which they harbor, in search of water. Consequently, many of the rats poisoned will die in open places from which the carcasses can be readily removed.

The bait selected, in each instance, should be a food material similar to that which is, or has been, accessible, and of which the rats are particularly fond. Included in this category are ground meats, fried bacon, fish, liver, grated or toasted cheese, peanuts and cereals, especially rolled oats and corn meal. Rats will at times, refuse to eat bait that has been handled by man, thus care should be taken so as not to touch the bait with the hands while preparing it. Use a knife or a spoon to mix the bait. Each bait should be placed in a small paper container, or torpedo, made by wrapping the bait in a piece of paper, the ends of which are twisted together. This method enables the rat to carry the bait to a secluded place for consumption and frequently rats will eat a bait thus prepared when they will not touch those that are openly displayed. The baits should be laid in places that are easily accessible and frequented by rats. The best results are obtained when the baits are placed alongside of walls or other similar objects.

In order to accustom rats to eating the kind of food materials which will be used to carry the poison, unpoisoned baits which are exactly like those that are to be employed later, except that they contain no poison, may be distributed for several days prior to placing the poisoned baits. The uneaten baits should be collected daily and replaced with fresh material. When unpoisoned baits are eaten freely by the rats, all those that remain uneaten should be collected and a comparatively large number of poisoned baits distributed. Frequently this procedure will result in the destruction of a large proportion of the population.

Traps, rat spring type, are available from Quartermaster in limited quantities. Trapping is a very practicable and efficient procedure for the control of rats, if it is persistently, skillfully and systematically carried out. If sufficient traps can not be obtained, then cage traps must be left to the individual ingeniousness in construction.

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Thanks Captain Pawley for a very interesting article.

(ED's Note: Barium carbonate when mixed with G.I. canned salmon proved to be most acceptable to rats, and enlisted personnel donated their ration on this item with great enthusiasm. Barium carbonate will keep your men happy, your rats slap-happy.)

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Some very interesting items were included in a report made by Captain Leroy D. Christensen, Sn.C., Commanding the 3rd Malaria Survey Unit, which is located at Bougainville.

1. Identity of the Most Common Anopheline of this Area. Specimens of the most common anopheline vector of malaria on this base submitted to the Army Medical Museum by Division entomologists have been identified as Anopheles punctulatus var. farauti Lav. This species is currently responsible for most if not all malaria transmission in the base unit coverage area, 99.1% of a large lot of anopheline larvae recently collected from all survey localities proving to be this variety. Anopheles punctulatus var. punctulatus is seldom encountered while a third anopheline which is being described as new at another base is also rare and not locally important.

2. Survival of Anopheline Larvae on Moist Soil Surfaces: The survival ability of Anopheles punctulatus var. farauti Lav. in the larval stage on moist soil surfaces was tested. The matter is of some practical importance since many larvae and eggs are left stranded in such a manner when ground pools dry. The ability of eggs to survive on moist surfaces for periods as long as 16 days when not exposed to direct sunlight has already been determined by the Efate, N. H., Malaria Control Unit.

Wet soil was placed in a number of containers with screen bottoms and then flooded. After anopheline larvae had been added, the containers were placed on drying racks in direct sunlight. The excess water quickly drained off leaving the larvae on the wet soil surface. At the end of 24 hours in direct sunlight, 50% of the larvae responded actively when removed to a water filled container. The soil surface was partially caked although still moist. The larvae on the surface of the soil were plainly visable and had mad no protective penetration. At the end of 28 hours 11 larvae were dead.

The ability of larvae and eggs to survive for the period indicated helps to explain the occasional finding of anophelines in recent filled pools. Although it might be concluded that all moist surfaces should be oiled, such a procedure is generally impractical. Experience has demonstrated that weekly oil applications to actual water surfaces result in excellent control pr vided coverage meets the required standard. Most ground pools with viable eggs and larvae would normally be oiled effectively upon becoming filled with water before anophelines could complete development. If a pool has been in existence long enough to develope mature larvae prior to drying, a previous oiling should have been effective.

SECRET

Life History of the Typical New Guinea Malaria Mosquito

by

Captain William R. Hosrfall, Sn.C.
Commanding Officer, 17th Malaria Survey Unit

I. INTRODUCTION.

1. One of the most important vectors of malaria parasites in New Guinea is the typical New Guinea malaria mosquito, Anopheles punctulatus typicus Don. It has been reported present generally over the island in association with high incidence of malaria. For this reason a study of its biology is of interest to all concerned with its control.

2. Observations related in this report were made during the past ten months; some were made at Base A others at Base B.

II. DISTRIBUTION.

1. Geographic limitations. A. Anopheles punctulatus typicus is most abundant in the hills of the island up to an elevation of at least 2000 feet. At Milne Bay it is the dominant species along 18 miles of the north shore. The north shore of the bay is a narrow coastal strip of clay soil back of which foothills and mountains rise precipitously. Abundant larval sites are provided in man-made depressions throughout the area because of poor percolation of water through clay. In the foothills of the Owen Stanley mountains inland from Cape Sudest and Oro Bay, Anopheles punctulatus typicus is also the dominant species. This region is very similar to that along the north shore of Milne Bay except that it is inland some miles. The nearly level coastal plain of sandy soil covered with a patchwork of kunai flats and scrub growth draining into mangrove and sago swamps has very few larvae of Anopheles punctulatus typicus.

B. Reports from elsewhere in New Guinea show the same geographic limitations of this species. Captain H. A. MALCOLM reported at the 32nd meeting of Allied Malaria Control Conference that Anopheles punctulatus typicus is dominant on a plateau 1500 feet above sea level 20 miles northeast of Port Moresby. In the Bootlass Inlet area of kunai flats and savannah forest near Port Moresby, Anopheles punctulatus typicus has not been collected according to this observer. Lieutenant R. F. LANGDON reported at the 30th meeting that Anopheles punctulatus moluccensis dominated the lower reaches of Lekekamo River valley for 10 miles inland. Both Anopheles punctulatus moluccensis were found 10 - 20 miles inland. At Bulldog, elevation 150 feet, and 30 air line miles inland, Anopheles punctulatus typicus was dominant. Back in the mountains no Anopheles punctulatus typicus were reported by this observer, but this observer reported it at Wau on the north side of the range at an elevation 3500 - 3800 feet. From Wau down the Markham River valley Anopheles punctulatus typicus is found in its usual places.

2. Habitat Limitations. A. Anopheles punctulatus typicus has habitat preferences within its geographical limitation. First preference is depression in clay soil such as tracks of animals, man and vehicles. About an army camp wheel ruts are most numerous, therefore this type of environment is the more important. Streams even though they are pooled were of little importance as sources of this species. Sago swamps comprise large acreages of water surface, yet they were in no instance important at Milne Bay. Pools, tracks and ditches exposed in part or wholly to sunlight were preferred to shady ones of the same sort. Anopheles punctulatus moluccensis was relatively abundant in stream margins, pools and more shaded situations.

III. LIFE HISTORY.

1. General Life History. A. Anopheles punctulatus typicus has the same general life history undergone by other members of the genus with variations in details. All development takes place in water. Eggs are laid singly on water but often they cluster forming various patterns. Eggs may float free,

but usually they rest in a meniscus against a floating object or against the margin. Hatching takes place as larva pushes off a cap at the anterior end of the egg. After skimming about at the surface for a short time a larvae comes to rest usually in a meniscus. Feeding begins after an hour or two on minute floating particles and microorganisms. These the larvae obtain by rotating their heads 180 degrees and vibrating their oral bristles thereby producing current that carries the particles to the mouth. Larvae pass through four instars and pupate in a week or so. The pupal stage lasts a day or two and the adult emerges. At night and possible on days that are heavily overcast these mosquitoes move about. Those that have not fed move toward sources of blood; those that are ready for oviposition move toward oviposition sites. Longevity of adults is rather variable being about 2 - 6 weeks during a summer for temperate species at least.

2. Life History of Anopheles punctulatus typicus. A. As is generally the case with Anopheles species, the life cycle of Anopheles punctulatus typicus is variable within limits. Development is rapid in unshaded pools during an interval when the sun shines much of each day heating the water to 95 degrees Farenheit and above. From such pools adults may emerge in a week or less after the initial flooding. Under normal conditions of partial cloudiness or rain and heavy cloudiness, development is retarded and may require two weeks.

B. In the laboratory where development was observed in petri dishes and complete shade where temperature ranged between 78 and 85 degrees Fahrenheit, immature stages were passed in 10 - 14 days or a mean of 11.2 days. The egg stage required 1 - 6 days, the larval and pupal stages required 7 - 12 days. The mean duration for combined larval and pupal stage was 8.5 days.

C. Egg Stage. (1) The variability of duration of the egg stage is most pronounced of any stage. In the laboratory eggs continuously floating hatched in 1-6 days. Most of them hatched in 2 days and the mean duration of the stage for 459 eggs was 2.5 days.

(2) Eggs may remain viable for a longer time when they are not floated. Several hundred newly laid eggs were placed on moist paper in petri dishes. The paper was allowed to dry very slowly in a covered dish where the air was nearly saturated with moisture. Even after 13 days of drying one-half of the eggs were still viable. A goodly percentage hatched even on the 14th day at which time the series was discontinued. There is no need to carry the series further to demonstrate that this species may survive in numbers through any dry weather likely to be encountered in an environment where the rainfall is similar to that at Milne Bay and Oro Bay.

(3) Eggs may be laid on moist surfaces as well as on water. Caged females in the laboratory were provided with a bowl containing moist filter paper and another beside it containing water. Sides of both bowls were lined with filter paper in order to prevent drying of those eggs that drifted into the marginal meniscus. Number of eggs laid under the two conditions were about the same. Furthermore note was made that in the bowl containing water most of the eggs were laid on the moist paper above the level of the water. An accurate statement on the numbers actually laid on a water surface is not possible because of the tendency for eggs to rise in marginal meniscus and to adhere to sides as water recedes. Significant it is that eggs may be laid on moist surfaces and when kept on moist surfaces may remain viable at least 14 days.

(4) Empirical field observations indicate that a similar situation exists in the field. For example at Milne Bay in October 1943 fourth-instar larvae were found in wheel ruts known to have been flooded only four days. Presence of larvae in this site can be accounted for only if eggs had been laid before flooding. A similar observation was made at Oro Bay. In an area where all depressions had been dry one week, larvae in the fourth-instar were collected a few days after a two-inch rainfall.

D. Adult Habits. (1) Anopheles punctulatus typicus may be found resting along vertical moist bands near sources of blood. Such resting places may be typified by one at Hanagela, a native village on the Embogo River in the edge of the foothills inland from Oro Bay and Cape Sudest. The most frequented resting place was a bank of the river within 50 yards of the huts. The bank is about six feet high, nearly vertical and pock-marked. In the shadow provided by the receding upper part of these holes most mosquitoes rested. None of the bank is directly exposed to sun. Further association that seems related to most suitable resting places is native passage or path over or by the bank. In the case of the bank described there is a path on top of the bank as well as at the river's edge below it. Very little grass and debris was found on the bank. Another good collecting site was along a low bank (2 feet high) with overhanging agela. This location was like the one described in that there was a well worn native path above and below the bank. Only scattered individuals were found on continuations of the bank up and down stream from the path. At Milne Bay this species was first collected in resting places across a river from a native village. There again they were found on a bank near the village a few yards up and down stream from a foot path used frequently.

(2) Duration of adult life in nature was not determined. A few females fed blood once in the laboratory lived 17 days. They could not be induced to feed a second time and no eggs were laid. Males fed raisins lived a week in the laboratory.

E. Flight Range. (1) The narrow valley of the Embogo River in the foothills at Hanagela village provided a convenient site for determining an outer limit for effective control of Anopheles punctulatus typicus. Developmental sites are confined to a narrow strip of land each side of the river which makes necessary their elimination in only two directions. No control measures had been applied, and the population of Anopheles punctulatus typicus was presumed to be as stable as natural phenomena are found.

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ENGINEERING

The following article is quoted from the South Pacific Navy newsletter of June 1944.

Use of Bangalore Torpedoes for Blasting Ditches Through Mangrove Swamps.

In an attempt to blast channels to the sea through a heavy mangrove swamp on Florida Island, Ensign [illegible]. L. Anderson, the base entomologist, has utilized Bangalore torpedoes to good advantage.

These torpedoes are 5-foot lengths of 2½ inch steel pipe loaded with Amapol. The torpedoes are fastened together, end to end, by a simple coupling and the ensuing length of pipe fed through the roots at soil level. Best results were obtained, especially where the trees are large and the roots dense, by laying down two lengths of the explosive side by side, exploding them simultaneously. The area in which they were used successfully was a succession of fresh-water swamps which were very nearly at sea level. In draining areas such as existed at this island, it was found that by the use of such explosives the ditches can be very easily extended far enough into the mangroves to reach water at a sufficient depth to obtain good drainage during low tides and to insure an adequate salt-water flush during high tides. Four such ditches, totaling 600 linear feet, were blasted in one hour using twelve men. The blasting on Florida Island was under the direction of a trained technician, and was performed by a Navy demolition squad in conjunction with their training program.

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A Study on the Survival of Microfariae (Bancroft's) in Citrated and Un-citrated Blood with Notes on Concentration Methods

Made by

Lts. H. A. Bern and M. F. Hansen
and laboratory technicians of 32nd Malaria Survey Unit

1. This study was considered of general interest to those who wish to do work on living specimens of microfilariae (Bancroft's).

2. Material for this study was obtained from natives known to be positive for microfilariae. Five cubic centimeters of blood were obtained from an arm vein. Immediately one large drop (size as formed at tip of 19 ga. hypodermic needle) was placed on each of two slides. One slide contained a drop of 1.1% median citrate and the other was clean and dry. Both slides had previously been ringed with petrolatum to prevent drying out after coverslip was placed over the specimen. The remaining blood was mixed in a test tube containing ½ cc of 1.1% sodium citrate. 16 such samples were taken.

3. Results of survival studies.

a. The microfilariae in the citrated blood survived at room temperature from 8 June 1944, 0100 to 10 June 2200, approximately seventry (70) hours. It was noted that as soon as homolysis of blood occurred and bacterial growth became abundant, the microfilariae were unable to survive. Homolysis occurred in twenty four (24) hours in some of the tubes. Both the citrated test tube samples and slide preparations showed the same survival periods.

b. Several of the citrated samples were insufficiently mixed so consequently the blood clotted. Only a few microfilariae were found in the serum; most of them were trapped in the clot.

c. The largest survival period was observed among those microfilariae on the slides with a drop of uncitrated blood. One slide contained live microfilariae from 8 June 1944, 1100 to 21 June 1944, 0800 -- a period of fourteen days. The highest mortality on these slides occurred at fifty six (56) hours at which time only thirty (30) percent of the slides showed living microfilariae . Twenty (20) percent of the slides contained living microfilariae for eleven (11) days.

4. Concentration of microfilariae.

a. Samples of serum and plasma were contrifuged. The plasma samples yield the heaviest concentration of living microfilariae.

b. A very heavy concentration was obtained by merely allowing the leucocyte layer to pass up into a small bore glass tube. In fact, this method proved to be the best since it allowed for as great or greater (as many as 25 living microfilariae per low power field) concentration of microfilariae per volume than centrifuged plasma, in addition to being quicker and less cumbersome.

c. Flotation methods using high specific gravity solutions proved unsatisfactory.

5. Conclusions:

a. For rapid detection and study of living microfilariae a single drop of untreated blood covered by a petrolatumed cover slip is adequate. Movement within the mass of red cells is sufficient to determine individuals positive for microfilariae. These specimens may live as long as two weeks.

b. The study of large numbers of microfilariae can be facilitated by allowing citrated blood to settle and carefully pipetting off the layer just above the sedimented red cells. The use of sterile techniques not available in this laboratory would considerable increase the viability of the specimens.

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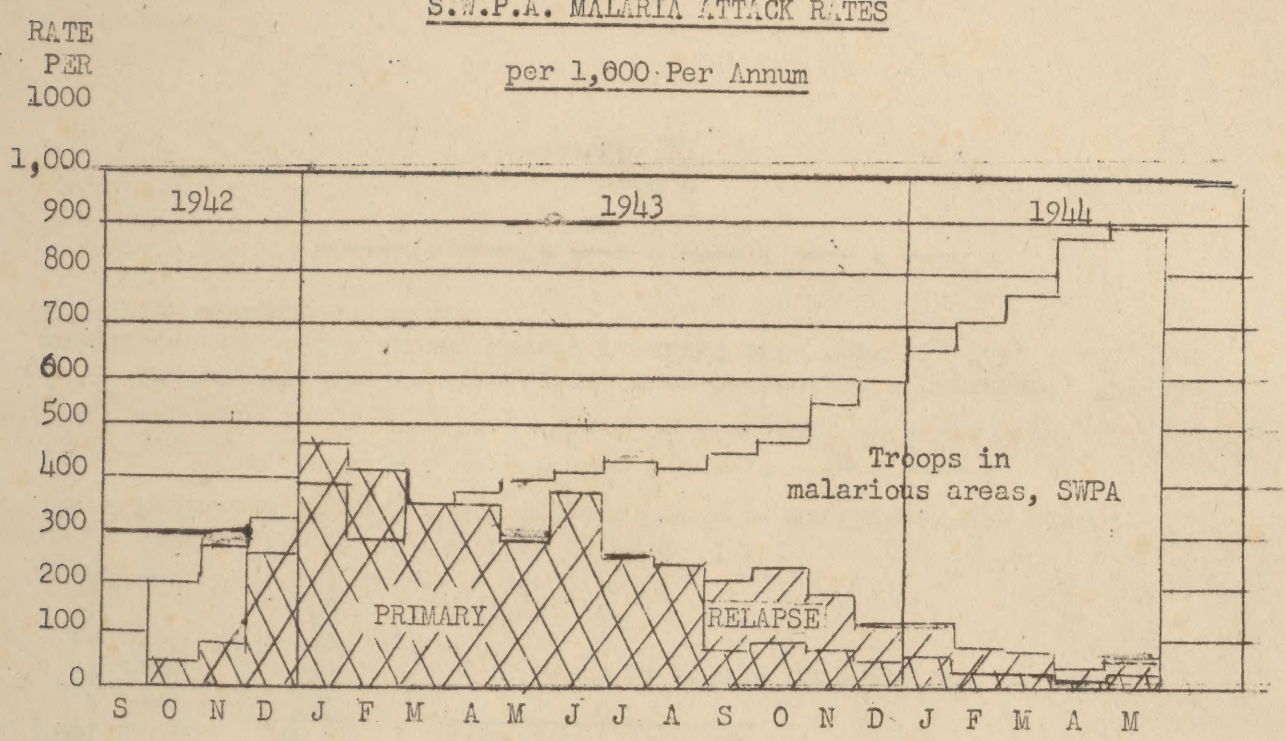
S.W.P.A. MALARIA ATTACK RATES

per 1,000 Per Annum



(a) Strength based on station lists, USAFFE.
(b) Rates computed from WDMD 86ab.
(c) Relapse rates prior to Sept. '43 not available.

NEWS of the UNITS

New Arrivals: 80th MCU, Captain M. M. Feldman, Sn. C., Commanding.
81st MCU, Captain Edward F. Gabrielson, Sn.C., Commanding.
82nd MCU, Captain Wm. Merritt, Sn.C., Commanding.
83rd MCU, Captain Victor W. Sauer, Sn.C., Commanding.
84th MCU, Captain P. J. Petitmermet, Sn.C., Commanding.
85th MCU, Lieutenant Erie H. Smith, Sn.C., Commanding.
86th MCU, Captain Francis F. Bergin, Sn.C., Commanding.
87th MCU, Captain Crawford J. Powell, Sn. C., Commanding.
88th MCU, Captain Clarence K. Dion, Sn.C., Commanding.

These units, with the exception of the 85th, are now at Finschhafen. The 85th has moved on to Saidor.

The 208th through the 211th MSU and the 89th MCU through to the 96th MCU are now staging at Oro Bay.

The 2nd MSU and 2nd MCU are not at Aitape with the 43rd Division.

Recent Changes: 26th MSU is now at Toem; 29th MSU is at Biak; 39th MSU is at Toem; and the 204th MSU is also at Toem. Of the Control Units, 11th is at Hollandia; 12th at Wadke; 55th at Biak; 61st is on Toem.

Major Jesuran, M.C., Base B Malariologist, has received word that he now holds the permanent rank of Captain in the Regular Army. Congratulations.

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MALARIA ATTACK RATE per/1000/annum for month of June 1944, for the weeks ending:

	USASOS	6th Army	5th AF	14th AA	USAFFE
ORO BAY					
4 June	40	27	134	28	0
12	37	13	15	113	0
18	28	28	33	0	5
25	25	35	49	73	0
30	40	34	58	138	12
LAE					
2 June	51	0	321		
9	34	0	0		
16	39	2600 *	152		
23	62	0	152		
30	28	0	39		

* Strength - 2 soldiers; cases - 1.

FINSCHHAFEN				
2 June	18.8	32.9	86.6	0
9	22.7	26.8	83.2	-
16	15.1	20.8	20.8	0
23	26.0	19.8	41.6	7.4
30	20.0	14.8	41.6	29.7
HOLLANDIA (Base G)				
Month of June	11	27	6	2
SAIDOR				
9 June			10.4	
16			21.32	
23			0	
30			72.8	

		5th Air Force
HOLLANDIA	5th AF	SOS troops with FAF
2 June	104	0
9 June	107	1105 (1 case - strength 38)
16	52	0
23	52	0
30	51	0

The above are all the rates that we have available this month.

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And who was the Malariologist, when he made this statement, "My the mosquitoes are thick around here", received this comment, "Ah, I see, you like your mosquitoes thin."

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